

## REMARKS

The Office Action dated April 15, 2009, has been received and carefully noted. The above amendments to the specification, drawings, and claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1, 12, 15, 18, 21-41, and 51-53 are currently pending in the application, of which claims 1, 21, 23-24, 28, 32, 35, and 40-41 are independent claims. Claims 1, 21-24, 28, and 32-41 have been amended to more particularly point out and distinctly claim the invention. No new matter has been added. Support for the amendments may be found in, for example, paragraph [0061] of the present application, which refers to channel profiles of the users including a time delay, which time delay translates into an coherence bandwidth; paragraph [0065] of the present application, which refers to the smallest coherence bandwidth as the small coherence bandwidth of users; and paragraphs [0069] and [0078] of the present application, which refer to the smallest coherence bandwidth as the smallest coherence bandwidth of the N users. Claims 1, 12, 15, 18, 21-41, and 51-53 are respectfully submitted for consideration.

The Office Action objected to the drawings. Replacement sheets for Figures 1, 4, and 5 are enclosed herewith, including helpful labels. However, Applicants respectfully submit that not all of the drawings require further labels, and, thus Applicants respectfully traverse certain portions of this objection.

Initially, Applicants respectfully submit that Figures 1 and 2 do not require any further labels because the elements of these drawings may be clearly recognized by one

having ordinary skill in the art and with reference to the specification. It is respectfully submitted that 37 CFR 1.84(n) provides that graphical drawing symbols may be used for conventional elements when appropriate. The elements for which such symbols and labeled representations are used must be adequately identified in the specification. Known devices should be illustrated by symbols which have a universally recognized conventional meaning and are generally accepted in the art. Other symbols which are not universally recognized may be used, subject to approval by the Office, if they are not likely to be confused with existing conventional symbols, and if they are readily identifiable. As can be clearly observed from 37 CFR 1.84(n) text written labels are not required. The only labels that are required are “representations...adequately identified in the specification.” It appears that all elements of the drawings are labeled with numerical identifiers which are adequately represented by the specification. Furthermore, there is no reason to believe that the elements of Figures 1 and 2 would cause confusion or would not be identifiable by one having ordinary skill in the art, since the user equipment devices are drawn with antennas and other indicia of those elements’ purpose. Withdrawal of this objection is respectfully requested.

As to Figure 6, Applicants respectfully disagree that the lines are unclear. Referring to Figure 6, beginning from the bottom of the graph, the first dotted line represents method 1, moving upward, the next dotted line represents method 7, then method 2, followed by methods 4, 6, 5, and lastly, nearest the top of the graph is method 3. One having ordinary skill in the art could unambiguously interpret the methods

association with the corresponding lines on the graph. Furthermore, such an accurate description will be made of record by the above-noted comments.

At item 4, the Office Action stated that the drawings must show every feature of the invention specified in the claims. The Office Action asserted that “the size of a set of sequential subcarriers is greater than the smallest coherence bandwidth of the plurality of users” must be shown or the feature(s) must be cancelled from the claims. As MPEP 608.02(I) states: “The first sentence of 35 U.S.C 113 requires a drawing to be submitted upon filing **where such drawing is necessary** for the understanding of the invention” (emphasis added). Likewise 37 CFR 1.81(a) states: “The applicant for a patent is required to furnish a drawing of his or her invention **where necessary for the understanding** of the subject matter sought to be patented’ (emphasis added). In this instance, such further illustration is not necessary.

Additionally, Applicants respectfully request an explanation of how such a feature would helpfully be illustrated in the Figures. Although Applicants are not averse to the Office Action’s request if such illustration would be helpful, it is unclear how the Office Action would like Applicants’ representatives to amend the drawings. If the Examiner has a particular suggestion, it is respectfully requested that the Examiner contact Applicants’ representative to discuss implementation of the amendment. In the absence of such assistance, Applicants are unclear as to what specific amendment is being required by this objection, and respectfully request that the objection be withdrawn as unclear.

The Office Action rejected claims 1, 12, 15 and 18 under 35 U.S.C. §101 for allegedly being directed to nonstatutory subject matter. The Office Action alleged that none of these claims are tied to a statutory class of invention, such as an apparatus. Applicants respectfully note that the recent decision in the Court of Appeals for the Federal Circuit (CAFC), *In re Bilski*, provided a new measure for the validity of method claims, although that case is under review by the U.S. Supreme Court.

The CAFC held that certain method claims will be found to recite patent-eligible subject matter if properly tied to an apparatus/machine or if they transform an article. Specifically, the court stated that a method must be tied “to a particular machine or apparatus” or it must “transform a particular article into a different state of thing.”

In the present application, method claims 1, 24 and 28 at least mention “a plurality of users” and these “users” imply particular devices which are tied to the method operations. Clearly, these “users” have (or are) the user equipment devices illustrated, for example, in Figure 1. This implication is clear from the fact that the claim recitations refer to the “channel currently being used by the...users.” Therefore, claims 1, 24, and 28 are in accord with the minimum requirements of *Bilski*. Withdrawal of the rejection is respectfully requested.

The Office Action rejected claims 1, 12, 15, 18, 21-41 and 51-53 under 35 U.S.C. §112, first paragraph, for allegedly failing to comply with the written description requirement. The Office Action alleged that the feature of “allocating a plurality of sets of sequential subcarriers...wherein the size of a set of subcarriers is greater than the

smallest coherence bandwidth of the plurality of users” is not disclosed in the specification as filed. Applicants have reviewed the specification in detail and respectfully disagree with the Office Action. Paragraph [0068] of the original specification discloses that “Even when the size of the set of sequential subcarriers is determined to be about twice the smallest channel coherence bandwidth...” This portion of the specification is a clear indication that the set of subcarriers is greater than the smallest coherence bandwidth.

This “greater” than scenario recited in the claims may appear to be counter-intuitive to some of the examples discussed in the specification. For example, since methods 1-6 of FIG. 6 include scenarios that include: each user receives equal parts of the bandwidth and equal subcarriers (method 1), the size of the subcarriers are less than the smallest coherence bandwidth (methods 2 and 5), the size of the subcarriers is about the same as the smallest coherence bandwidth (methods 3 and 6), a rotation of assigning the subcarriers is used (methods 4 and 7, noted as prior art in the specification) (see paragraph [0061] onward in the specification). However, since paragraph [0068] does leave open the possibility for the size of the set of sequential subcarriers being determined to be about twice the smallest channel coherence bandwidth, then, the Office Action was incorrect to reject the claims under 35 U.S.C. §112, first paragraph, for at least the reason that paragraph [0068] supports the subject matter recited in the pending claims. There is no requirement that the claims correspond to every embodiment presented in the application.

The presently claimed invention, in certain embodiments is based on what is considered to be the surprising finding that there is no significant decrease in spectral efficiency even when the size of the set of sequential subcarriers is greater than the smallest channel coherence bandwidth. Cited section [0068] of the specification is consistent with the claimed invention, because it refers to how the reduction in spectral efficiency is only minimal even when the size of the set of sequential subcarriers is greater than the smallest coherence bandwidth. It is true that the original specification also includes a description of results achieved when the size of the set of sequential subcarriers is not greater than the smallest coherence bandwidth. However, Applicants respectfully submit that there is no bar against having claims that do not cover each and every technique described in the specification. Furthermore, the inclusion of the description of results achieved when the size of the set of sequential subcarriers is not greater than the smallest coherence bandwidth is useful for imparting information about the presently claimed invention, because they serve to demonstrate the above-mentioned finding with respect to certain embodiments.

The Office Action also rejected claims 21, 22, 23 and 32-39 under 35 U.S.C. §112, first paragraph, for allegedly being directed to single-means type claims. This rejection is moot in view of the amendments to the claims, and withdrawal of the rejection is respectfully requested.

The Office Action rejected claims 1, 12, 15, 18, 21-41 and 51-53 under 35 U.S.C. §112, second paragraph, for allegedly being indefinite. The claims have been amended.

The presently pending claims do not suffer from any of the alleged deficiencies, and are in compliance with 35 U.S.C. §112, second paragraph. Withdrawal of the rejection as moot is respectfully requested. To expedite prosecution, some additional comments are provided.

Regarding section 28 of the Office Action, even if the presented analysis of the formula at paragraph [0064] of the specification (as published) is right for the very extreme and hypothetical situation where the smallest coherence bandwidth is of the order of the total multicarrier modulation bandwidth, the formula and the reference to  $F=2$  provide a technical teaching that is applicable to practical situations such as that described at paragraphs [0060] and [0061] where the average coherence bandwidth (which, of course, can be no larger than the smallest coherence bandwidth) is stated to be 2.4MHz for a multicarrier modulation bandwidth of 100MHz.

The Office Actions comments at section 15-18 are similar to those at section 28. As such, they relate to an extreme and hypothetical situation that is not mentioned as a practical situation in the specification of the present application. As mentioned above for section 28, the Office Action's comments do not apply for the kind of practical situation mentioned at paragraphs [0060] and [0061] of the present application.

Particularly with respect to section 18 of the Office Action, Applicants respectfully note that the claims refer to allocating subcarriers and to signalling information about the allocated subcarriers. With reference to paragraphs [0054] and [0073] of the present application, one advantage of allocating a sequential sub-carrier set

that has a size greater than the smallest coherence bandwidth is that it simplifies the signalling required to inform the respective user of the identity of the sub-carriers allocated to that user. This advantage remains even in the hypothetical event mentioned by the Office Action, that the channel profile of one of the users later changes after allocation; the advantage of simplified signalling has been achieved, and as discussed in the specification, the fact that one of the remaining users might end up after allocation using a subcarrier set having a size that later becomes less than the smallest coherence bandwidth of the remaining users would not have a negative impact on the spectral efficiency, according to the above-mentioned finding of the inventors. Thus, for these additional reasons, withdrawal of the rejection is respectfully requested.

The Office Action rejected claims 1, 12, 15, 18, 21-41, and 51-53 under 35 U.S.C. §102(e) as allegedly anticipated by U.S. Publication No. 2004/0081131 of Walton ("Walton"). Applicants respectfully submit that the claims recite subject matter that is neither disclosed nor suggested in Walton.

Applicants respectfully submit that the arguments set forth in the Pre-Appeal Brief Request for Review (PABRFR) of June 25, 2008, remain valid objections to the rejections of the claims. The distinctions noted in the PABRFR have not been addressed by the present Office Action, and should consequently be taken as admitted, since the Office Action has not found any response to them. If the Examiner disagrees, a response to Applicants' arguments of record is respectfully requested.



37 C.F.R. § 1.104(b) explicitly requires that “[t]he examiner’s action will be complete as to all matters”. Furthermore, the MPEP states that “In order to provide a complete application file history and to enhance the clarity of the prosecution history record, an examiner **must provide clear explanations** of all actions taken by the examiner during prosecution of an application” (MPEP § 707.07(f) – emphasis added). “Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant’s argument and **answer the substance of it**” (Id., emphasis added). It is respectfully submitted that because the substance of the distinctions above have not been answered, the present Office Action is incomplete.

For the Examiner’s convenience the distinctions are presented below:

As described in Applicants’ prior submissions, certain recited embodiments of the present application relate to allocating subcarriers in a multicarrier modulation communication system. Specifically, a plurality of sets of sequential subcarriers to a plurality of users are allocated such that the size of a set of sequential subcarriers is greater than the smallest coherence bandwidth of the plurality of users.

In contrast, Walton generally relates to using orthogonal frequency division multiplexing (OFDM) symbols of different sizes to achieve greater efficiency for OFDM systems. The system traffic may be arranged into different categories (*e.g.*, control data, user data, and pilot data). For each category, one or more OFDM symbols of the proper sizes may be selected for use based on the expected payload size for the traffic in that category. For example, control data may be transmitted using OFDM symbols of a first

size, user data may be transmitted using OFDM symbols of the first size and a second size, and pilot data may be transmitted using OFDM symbols of a third size or the first size.

Referring, for example, to claim 1, Walton fails to disclose or suggest, at least the recitation of “allocating a plurality of sets of sequential subcarriers in a multicarrier modulation communication system to a plurality of users, wherein the size of a set of sequential subcarriers is greater than the smallest coherence bandwidth of the plurality of users.” Walton discloses, for example, using OFDM symbols of different sizes to minimize cyclic prefix overhead and maximize packing efficiency (paragraph [0012] of Walton). Walton also discloses that for OFDMA, multiple users share the large OFDM symbol using frequency domain multiplexing. This is achieved by reserving a set of subbands for signaling and allocating different disjoint sets of subbands to different users. See paragraph [0010] of Walton. However, there is no teaching or suggestion in Walton of **allocating** a plurality of sets of sequential subcarriers in a multicarrier modulation communication system to a plurality of users, wherein the wherein the **size** of a set of sequential **subcarriers** is **greater** than the **smallest coherence bandwidth** of the plurality of **users**, as recited in the presently pending claims.

Thus, Applicants urge that Walton fails to disclose or suggest, at least, “allocating a plurality of sets of sequential subcarriers in a multicarrier modulation communication system to a plurality of users, wherein the size of a set of sequential subcarriers is

**greater than the smallest coherence bandwidth of the plurality of users,**” as recited in claim 1 of the present application.

The Office Action and the Advisory Action allege that Walton, for example, at paragraphs [0031], [0032] and [0125], discloses the use of a set of subbands having a width greater than the smallest coherence bandwidth. Applicants have carefully reviewed these and other sections of Walton and respectfully urge that this alleged interpretation of Walton is clearly technically and factually incorrect. Applicants note, for example, that Walton at paragraph Section [0032] states that "the largest OFDM symbol that may be used is typically constrained by the coherence time of the wireless channel, which is the time over which the wireless channel is essentially constant". The term "coherence time" used here should not be confused with the term "coherence bandwidth" used in claim 1 of the present application. Coherence time has, in principle, nothing to do with coherence bandwidth. The coherence time is the inverse of the Doppler spread, and is related to the motion of the mobile station. Coherence bandwidth is proportional to the inverse of the delay spread, and is thus related to multipath propagation in a channel, not to the movement of the mobile station. It is considered that the part of this section [0032] of Walton relating to coherence **time** has no relevance for the invention claimed in claim 1 of the present application, which defines the size of a carrier set in terms of coherence **bandwidth**.

Similarly, Walton at paragraph [0125] discloses using OFDM symbols of different sizes, but provides no disclosure that the size can exceed the coherence bandwidth.

Applicants further note that Walton at paragraph [0125] teaches the use of relatively long sets of subbands of the same steering vector obtained for a relatively short set of subbands. Applicants therefore urge that paragraph [0125] of Walton contains no teaching or disclosure contrary to the above-described teaching of section [0032] that discloses using only a set of subbands having a bandwidth smaller than the coherence bandwidth. Furthermore, the last four lines of paragraph [0125] discloses that sets of subbands having a width close (but still less than) to the coherence bandwidth suffer degradation when the SNR is high. Therefore, this disclosure in paragraph [0125] of Walton clearly teaches using a set of subbands having a bandwidth much smaller than the coherence bandwidth. Therefore, the rejection is technically incorrect and clearly in error.

For at least these clear technical and legal errors, Applicants urge that Walton fails to disclose each and every limitation of independent claim 1. As such, it is respectfully requested that the rejection of claim 1 is incorrect and should be withdrawn. Likewise, dependent claims 12, 15, 18, and 51-53 should be allowed on similar grounds, as well as for the respective limitations recited within these claims. Withdrawal of this rejection of claims 1, 12, 15, 18, and 51-53 and reconsideration of these claims in view of the preceding explanations are respectfully requested.

Similarly, independent claims 21, 23, 24, 28, 32, 35, and 40-41, although different in scope from claim 1 and rejected on different grounds, also contains similar recitations related using a set of subbands having a bandwidth larger than the coherence bandwidth.

Thus, Walton similarly fails to teach or suggest each and every limitation recited in independent claims 21, 23, 24, 28, 32, 35, and 40-41, and for at least this reason, Applicants urge that the rejection of these claims in view of Walton is clearly in error. Likewise, dependent claims 22, 25-27, 29-31, 33-34, and 36-39 should be allowed on similar grounds, as well as for the respective limitations recited within these claims. Withdrawal of this rejection of claims 21-41 and reconsideration of these claims in view of these arguments are respectfully requested due to the clear errors.

For the reasons set forth above, it is respectfully submitted that each of claims 1, 12, 15, 18, 21-41, and 51-53 recites subject matter that is neither disclosed nor suggested in the cited art. It is, therefore, respectfully requested that all of claims 1, 12, 15, 18, 21-41, and 51-53 be allowed, and that this application be passed to issuance.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, Applicants' undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Peter Flanagan", is written over a horizontal line.

Peter Flanagan  
Attorney for Applicants  
Registration No. 58,178

**Customer No. 32294**  
SQUIRE, SANDERS & DEMPSEY LLP  
14<sup>TH</sup> Floor  
8000 Towers Crescent Drive  
Vienna, Virginia 22182-6212  
Telephone: 703-720-7800  
Fax: 703-720-7802

PCF:dlh

Enclosures: Replacement Sheets (3) for Figure 1-2 and 4-5